UNITED
NATIONS

E

Economic and Social
Council

Distr.
GENERAL

E/CN.16/1995/3
16 March 1995

ORIGINAL : ENGLISH

COMMISSION ON SCIENCE AND TECHNOLOGY
FOR DEVELOPMENT
Second Session
Geneva, 15 May 1995
Item 2 of the provisional agenda

SUBSTANTIVE THEMES: (b) THE GENDER IMPLICATIONS OF SCIENCE AND TECHNOLOGY FOR DEVELOPING COUNTRIES

Science and technology for sustainable human development: The gender dimension

Report of the Panel

Pursuant to Economic and Social Council resolution 1993/74, the Panel on the Gender Implications of Science and Technology for Developing Countries has completed its work. The report of the Panel is submitted to the Commission for its consideration.

GE.95-50865

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Executive summary

Objective:

To make recommendations to national Governments for individual country actions; and recommendations to Economic and Social Council for reforms required in the United Nations system on "gender, science and technology".

Process:

This report has been prepared by a working group of eight male commissioners and eight female advisors. They have been assisted by 20 consultants, and several women's non-governmental organizations (NGOs), and United Nations agencies. The process, described in the annex, has been highly consultative and participatory.

Key Findings:

(a) **Gender inequity in education and careers in science and technology**
There are serious obstacles to girls and women's participation in scientific and technical education and careers, and there are relatively few women in science and technology decision-making bodies and advisory boards.

(b) **The gender-specific nature of technical change**
Technical change aimed at benefiting people in rural areas in developing countries appears to have benefited men's lives more than women's lives.

The premise that development is gender specific underpinned the analysis of the Gender Working Group. That is, women and men have different roles and responsibilities and perform different tasks. To ensure that science and technology benefits all members of society, attention must be paid to the respective needs and interests of men and women equitably.

Seven issues on which "**Transformative Actions**" are both necessary and feasible were defined, and lists of possible actions were identified. The seven issues were:

- Gender equity in science and technology education
- Removing the obstacles to women in scientific and technological careers
- Making science responsive to the needs of society: the gender dimension
- Making science and technology decision-making more gender aware
- Relating better with local knowledge systems
- Addressing ethical issues in science and technology: The gender dimension
- Improving the collection of gender disaggregated data for policy makers

A "**declaration of intent**" consisting of six goals for equity in science and technology was formulated and all Governments are invited to subscribe to this declaration and to establish an ad hoc committee to formulate national action plans for its implementation.

The United Nations Review:

An extensive review of the performance of the United Nations system in gender, science and technology resulted in a set of recommendations for transmission to the Economic and Social Council.

INTRODUCTION

1. At its first session in 1993, the United Nations Commission on Science and Technology for Development agreed on criteria for selecting topics for its second session in 1995. One of the criteria agreed on was to address science and technology components of major United Nations Conferences to be held in 1995. The Fourth World Conference on Women and Development to be held in Beijing, China, was such an example. Consequently, the Commission chose "Gender, Science, Technology and Sustainable Human Development" as one of the three topics for its second session. This report, which is an input to the Commission's deliberations, has been prepared by the Gender Working Group consisting of eight women and eight men. They were assisted by 20 consultants who prepared expert papers, and by many non-governmental organizations active in gender, science and technology, along with individuals, academics and United Nations agencies. Three-quarters of the Gender Working Group were from developing countries. (See annex for information on the method of work.)

2. The remit of the Panel on Gender Implications of Science and Technology for Developing Countries, hereafter referred to as the Gender Working Group, is defined by the area of overlap of three domains: science and technology; sustainable human development; and gender. This overlap has not been deeply explored in the past. Before turning to the results of the Gender Working Group's analysis, it is first necessary to identify some of the essential elements of these three domains. This enables us to identify the common perspectives shared by all members of the Gender Working Group and provides the basis for the diagnosis and prescriptions presented in subsequent chapters.

3. With regard first to "science and technology", a distinction was made between the development, diffusion and utilization of modern science-based technologies and local knowledge and traditional technologies that had evolved over many years of trial and error within communities. Both knowledge systems are important for sustainable human development, but the science-based technologies have formed the basis for industrialization in the more developed countries over the past 100 years. Those developing countries that have invested in their own modern scientific and technical capabilities have been able to join the industrialization process. Several East Asian countries have experienced remarkable economic growth rates over the past 20 years by relying on this strategy.

4. Developing countries that have not been able to make comparable investments in their own scientific and technical capabilities have not shared in these advances. Current globalization trends are rendering these countries increasingly marginalized. There now exists a wide spectrum of developing countries, ranging from those with little capability in science and technology which are all but excluded from the global economy, to those with advanced capabilities and whose economic growth rates are out-stripping many of the older developed countries.

5. It is not only in economic growth and wealth creation that science-based technologies have made substantial contributions. Major transformations in agricultural practices have also been made possible by new technologies. Perhaps most dramatic has been the contribution of modern science to health and the eradication and amelioration of diseases and improvement in world-wide health care.

6. The impact of science and technology on society has not been uniformly beneficial. Not all members of society have shared in the benefits; the development of weapons of mass destruction and growing pollution and environmental degradation are the reverse side of the coin. Likewise, social problems of alienation, unemployment and increased crime, often seem to follow in the wake of technical change. Technological changes, for good or for ill, do not automatically spring from the results of scientific research. They are a consequence of countless decisions made by scientists, engineers, corporations and Governments, which collectively dictate the impact of science and technology on the lives of everyone. It must become an objective

of science and technology policy to maximize the benefits to be derived from science and technology, and to minimize its harmful effects for all members of society. This objective underlies the approach to examining the gender dimension of science and technology.

7. The second domain of analysis is that of "sustainable human development". This is the dimension of development that emphasizes people rather than economic growth *per se*. It seeks to improve the quality of life of all people today without harming the prospects of future generations. This concept has been elaborated by United Nations Development Programme (UNDP) in successive human development reports and it is the type of development to which the Gender Working Group subscribes.

> **"Sustainable human development should join sustainable development and human development every day, in practice, on the ground around the world. It is development that does not merely generate growth, but distributes its benefits equitably; it regenerates the environment rather than destroying it; it empowers people rather than marginalizing them; it enlarges their choices and opportunities and provides for peoples' participation in decisions affecting their lives. Sustainable human development is development pro-poor, pro-nature, pro-jobs, and pro-women. It stresses growth with employment, growth with environment, growth with empowerment, growth with equity."**[1]

8. The third domain is that of "gender". The Gender Working Group accepted the conclusions of previous studies that had demonstrated that development itself is gender-specific. Gender refers to the distinct roles that men and women are assigned in any society. As a result, women and men tend to assume distinct socially and culturally defined responsibilities and tasks both within the household and in the wider community. The knowledge and experience gained from undertaking these tasks, as well as their requirements, lead women and men to have different needs and aspirations. This concept of gender differentiation underpins the conviction that "science and technology for development" must systematically and purposefully recognize the gender-specific nature of development and respond to the concerns, needs and aspirations of both women and men appropriately and equitably.

9. Not only is development itself gender-specific, but all studies point to the fact that women are among the poorest of the poor, and are notably disadvantaged. In the words of the 1993 United Nations Development Programme Human Development Report:

> ***"In industrialized countries, gender discrimination is mainly in employment and wages, with women often getting less than 2/3rds of the employment opportunities and about 1/2 of the earnings of men. In developing countries, the great disparities, besides those in the job market are in health care, nutritional support and education. For instance, women make up 2/3rds of the illiterate population. South and East Asia, defying the normal biological result that women live longer than men, have more men than women. The reasons: high maternal mortality and infanticide and the nutritional neglect of the girl child."***[2]

10. Within the area defined by the overlap of these three domains, the Gender Working Group was asked to make science and technology policy recommendations to national Governments; to review the performance of the United Nations system and suggest improvements; and to provide advice to "other relevant organizations". In attempting to fulfil its mandate, the Gender Working Group was hindered by the paucity of available data. The data which do exist strongly suggest that in the area of concern, women are more disadvantaged than men. More attention must be paid in the future to the collection of data on (a) "participation rates of women" in science and related decision-making bodies and (b) the "differential impact of technical change" on the lives of men and women. Incidentally, on this latter point, there is substantially more data available on the impact of science and technology on the lives of poor women than on the lives of poor men.

11. Particular attention was paid to the gender dimension of science and technology for basic needs in developing countries. It was hoped that this approach would complement the recommendations of the Panel on Technology for Small-scale Economic Activities to address the basic needs of low-income populations. It became apparent, however, that the fundamental issues were germane to all countries. They often differed between countries only in context, scale and scope. Thus, although the primary focus of this report is on transformative actions for developing countries, it ends with a challenge to all Governments to sign a "declaration of intent" in support of a set of principles which the Gender Working Group believes should underlie every country's approach to gender and science and technology for development.

I. THE DIAGNOSIS

12. At the close of the twentieth century, women in the rural areas of developing countries are still experiencing serious difficulty in meeting their own basic needs and those of their households. Scientific and technological interventions have improved many aspects of women's lives, contributing to important declines in both maternal and infant mortality. However, over the last three decades, women in the developing countries have also become disproportionately poor in relation to men in their own communities. Several recent United Nations reports have documented women's differential poverty as a significant phenomenon requiring policy attention and intervention. This well-defined world-wide disparity between men and women cannot be understood without explicit reference to the gender-specific nature of development, including scientific and technological contributions to the development process.

Box 1

The United Republic of Tanzania prepares a "gender sensitive environmental policy"

The poverty of women in rural areas is demonstrated in the United Republic of Tanzania, where land, cattle and property are owned and inherited by men. Land allocations are made to heads of households who are usually men. Women are additionally handicapped by their limited access to education and even more limited access to modern technologies. Wood for fuelwood provides 95 per cent of the domestic energy used for cooking by both rural and a majority of urban dwellers. Fuelwood is also used in such agriculture-related activities as tea processing and fish smoking and in small-scale industries like pottery and blacksmithing. Shortage of fuelwood means that many women spend 5 to 8 hours per day collecting it.

The demand for fuelwood, coupled with agricultural clearance, timber harvesting, over-grazing, and cultivation of marginal lands has led to increased erosion and desertification, loss of biodiversity and increased prevalence of water pollution. This has a more severe impact on women than men. As a result, a "national environment policy" is being formulated to make development sustainable. The objective is to benefit men and women equally as key players in national resource management and conservation. The objective is to devise a gender-sensitive policy for the environment that recognizes the gender-specific nature of development and the different roles and responsibilities of women and men.

13. The present report focuses primarily on the basic needs of men and women in rural areas in developing countries. This is where most of the poorest people live and where there is strong evidence, collected over the past 20 years, that development itself is gender-specific. It was recognized that gender is also a component of science and technology issues in the urban

areas of developing and developed countries. While some reference is made to these issues, they have not been explored as fully as basic needs in rural areas. To assist the Gender Working Group with its analysis, background papers were commissioned from leading experts to diagnose ways in which science and technology have differentially affected the lives of men and women in various key sectors. The sectors include environment, health, agriculture, energy, information, education, employment, small and medium-sized enterprises, and indigenous knowledge systems.

14. Two main conclusions have been drawn from the evidence presented in the background papers:

(a) **Gender inequity in education and careers in science and technology**

- In most developing countries, there are serious obstacles to girls and women receiving an education in science and technology and in pursuing scientific and technical careers. Similar obstacles also exist for women in developed countries, particularly with regard to advanced science and technology training and education. These obstacles, which extend beyond those faced by boys and men, prevent women from fully contributing to advances in science and technology, including ones that could better meet women's basic needs and support their hopes and aspirations for the future.

(b) **The gender-specific nature of technical change**

(i) Technical changes aimed at benefiting people in rural areas in developing countries have, in fact, tended to benefit men more than women. This is because science and technology programmes have not explicitly recognized the gender-specific nature of development. As a result, technical changes offered to women have often been inappropriately formulated and designed.

(ii) Although women in the rural areas of developing countries have the most significant difficulties in meeting their basic needs, in urban areas women are also poorer than men and are likewise affected differentially by technical change.

These conclusions are elaborated further below.

A. Gender inequity in education and careers in science and technology

15. More girls remain marginalized from the mainstream of education than boys. Girls do not enjoy equal access to a formal education. Outside the education system, the disparity between women and men in terms of literacy and access to science and technology training is pronounced. Among girls who do gain entry to school, fewer study science and fewer advance to high levels in science and technology where women are clearly under-represented. Girls and women are disadvantaged compared with boys and men both in acquiring a scientific and technical education and in entering and staying in scientific and technical careers. This conclusion is not new.

16. A recent series of national government task forces, regional workshops on gender in science and technology and international reviews[1] have analyzed the evidence and reached similar conclusions. Many of the observations made about education and careers apply to all countries, although some aspects are culture and country specific. All agree that in most developing countries:

- Cultural attitudes and gender stereotyping are obstacles to education and careers for girls and women;

- More boys than girls receive a basic education;

- Among those who receive an education, more boys than girls study science and technology;

- There are more men than women in scientific and technical careers;

- There are very few women in science and technology policy - and decision-making positions, or on advisory boards.

17. Some of these conclusions are demonstrated graphically in the accompanying figures. Figure 1 is particularly interesting as it demonstrates that there have been substantial improvements in the gender balance of students studying science and technology subjects in tertiary education in many regions of the world. The exceptions are Africa, where the ratio of women to men has remained at around 10 per cent over the last twenty years, and eastern Europe where the ratio has declined over the past ten years. Figures 2 and 3 illustrate the wide range in terms of the gender balance within scientific and technological careers from one country to another.

18. There are compelling reasons to create policy and institutional environments which foster and promote gender equity in education and careers and decision making in science and technology. Beyond the moral force of fairness there is also the need for countries to succeed in the global marketplace. Governments of developed and developing nations alike recognize the need to maximize the creativity and ingenuity of all available human resources. Marginalization of one-half of the pool of national talent does not make good sense.

19. The Gender Working Group explored the reasons why there is such pronounced under-representation of girls in technical education and women in scientific careers. Although there is considerable variation between countries and cultures, and despite improvements in some countries over the past twenty years, there nevertheless appears to be a set of common characteristics which contribute to the persistent under-representation of women in science.

20. The Gender Working Group identified a range of factors that serve to mitigate against young girls gaining access to the school system and pursuing a science and technology stream, including:

- Social conditioning and gender stereotyping particularly of young children world-wide;

- Lack of national government resources to support education for all, and in some cultures, a national bias favouring the education of boys over the education of girls;

- Parental preference favouring the education of boys over girls owing to cultural reasons and economic constraints which result in young girls assuming family and household responsibilities early in their lives;

- The misleading perception of parents, some teachers and guidance counsellors that science and mathematics are "difficult subjects" and not as suitable for girls as for boys;

- Curricula and textbooks that do not relate science to everyday experiences of both boys and girls, contain gender-biased language and which fail to give due recognition to the contributions to women scientists or promote women role models for girls;

- The fact that in some countries, girls' schools are not as well equipped with laboratories and equipment as are boys' schools.

21. Among the many factors that explain why women are under-represented in scientific careers are:

- The challenge of combining family responsibilities with professional careers where household responsibilities are not equitably shared;

- The pace at which science advances makes it difficult to re-enter a scientific career once it is interrupted to raise a family or for other reasons;

- The difficulty of breaking into the formal and informal scientific networks that characterize the workings of the scientific community and which have been largely male dominated.

- The reluctance of some employers to invest in the training of women owing to the perceived likelihood of their leaving the organization to raise a family.

Box 2

Breaking the isolation
- Building networks of support for women in science -

One of the most frequently cited factors creating a "chilly climate" in the sciences for professional women is their "isolation" in a male-dominated domain. Efforts to bridge this isolation and provide peer support have led to the formation of several regional and global networks by creative non-governmental organizations in the last decade. Examples include a student's electronic network connecting women studying computer sciences; the Third World Organization for Women in Science (TWOWS), the Forum for African Women Educationalists, the Gender, Science and Development network of the International Federation of Institutes for Advanced Studies, Canada (IFIAS), the World Women's Veterinary Association (WWVA), Women Inventor's Association, Gender and Science and Technology (GASAT), Women in Science and Engineering (WISE), Women in Science and Technology Development through APPROTECH-Asia, Women in Science Enquiry Network (WISENET), and the Pan-African Women Engineers Technicians and Scientists (PAWETS) network.

PAWETS, for example, was founded at the International Congress on Women Engineers and Scientists in 1987 by the Ugandan member of the Commission on Science and Technology for Development Advisory Board to the Gender Working Group. It links associations of women engineers, scientists and technicians in Africa. PAWETS promotes the participation of girls and women in science and technology education and training with the goal of increasing African girls and women's scientific literacy. Career guidance materials are developed for national associations to use in country-specific campaigns. Career re-entry support programmes are also supported. A regional seminar, organized by PAWETS and sponsored by UNESCO, recently advanced recommendations to Governments, the Organization of African Unity (OAU), non-governmental organizations, and science and technology centres.

B. The gender-specific impact of technical change

The rural impact

22. The conclusion regarding the impact of technical change in rural areas has been drawn from the analysis of the commissioned papers. Although some members of the Gender Working Group considered them firm conclusions, others viewed them as hypotheses that required further testing.

(a) The potential of science and technology to effect changes in the lives of rural women and meet their basic needs has not been fully realized.

Box 3

Off the Shore and into the boats and boardrooms
- women in the fishing industry in Mexico -

The fishing industry in Mexico has been traditionally a male preserve. Women have been excluded "technologically" from access to the benefits of the full set of activities in the cycle of fishery production. For example, in the tuna and shrimp industry, the cycle starts with large vessels and netting technologies designed for men and requiring strong muscles to operate.

Only recently, through research promoted by the female minister of fisheries, has attention been paid to the development of fisheries technologies to enable women to participate fully in all aspects of the industry -- navigating vessels, managing the catch, transporting, processing and marketing. Through these newer technological developments, women as well as men can now participate in the full cycle of value added activities. Creating accessible technologies has allowed women to achieve real economic recognition for their work. Furthermore, once active in all aspects of the sector, women with practical experience can also assume more prominent positions in the bodies that set policy for the industry.

(b) Most science and technology programmes oriented toward addressing basic needs in rural areas of developing countries have failed to recognize the gender-specific nature of development.

(c) Most technical change appears to have been oriented to the tasks that men perform and to men's interests and needs in the development process.

Box 4

The differential impact of technical change in poultry and dairy farming in Egypt

In Egypt, poultry and dairy production had been solely the responsibility of rural women. New large-scale farming technologies and methods were introduced for poultry and dairy production which displaced the women farmers. The result: women and their families in rural areas were impoverished and men from outside the villages benefited. If smaller scale technologies had been introduced and the women trained to use them, the benefits would have accrued to the women's families and the villages.

(d) Although some technical advances clearly benefit society as a whole, other scientific and technological activities may cause harm for some groups of people or some aspects of the natural environment. Individuals may lose income, jobs or status. There may be unwanted environmental impacts, such as the spread of pollution or toxic contamination. Women have been differentially and, in many cases, more adversely affected by negative consequences in the sectors investigated by the Gender Working Group.

Box 5

Women and health: Selected research implications

The role of women differs from that of men as providers and receivers of health care. The health issues and concerns of women over a complete life-cycle differ significantly from those of men. Women carry most of the responsibility for reproduction and family maintenance; they are the central care-givers for children and the elderly in the household and community and thus are pivotal instruments in terms of the health of three generations.

Medical research related to women in developing countries has focused mostly on reproductive biology. As this is an important issue, more research is needed on its biomedical, clinical, epidemiological and social science aspects so as to strengthen reproductive health services. However, these are not the only health problems faced by women in developing countries. Additional research must be aimed at other issues that affect women throughout their lives. Women seem particularly susceptible to some diseases owing to their exposure to pollutants in the natural environment and their specific physiological susceptibility and responses to pollutants.

(e) A substantial amount of local traditional knowledge is held by women: in agriculture, environmental resource management and in health. This knowledge is often not the same as that held by men in the same areas. There is a need to find more effective ways to recognize the value of this gender-specific knowledge and to integrate it with modern science and technology for sustainable development.

Box 6

Integrating "modern" and "indigenous" knowledge systems for more sustainable community development

Community-based knowledge and technologies may lack a detailed theoretical base, but still provide a valuable and practical community focus on subsistence strategies, particularly with respect to agriculture, nutrition, health, sanitation and housing. Community-based knowledge systems are usually decentralized and depend upon human resources and ingenuity rather than external funding. The spread of such knowledge is almost always informal and based on oral history. Changes brought about in this system tend to be incremental in nature. Women are major, if not predominant innovators of technology and users of indigenous or local knowledge.

In contrast, institutional science derives its methods and intellectual foundation from seventeenth century Europe and has developed synergistically with industrialization. The "institutionalized science system" is highly centralized, hierarchical and dominated by men with several years of specialized formal education. The system is heavily financed by public and private funding. Progress is typified by radical discovery breakthroughs; intellectual property rights are recognized and well-protected.[4]

A successful example of development initiatives aimed at integrating modern and traditional knowledge systems is the case of "Bean Breeding in Rwanda". Initiated by CGIAR, scientists from the Centro International de Agricultura Tropical (CIAT), and the Institut des Sciences Agronomiques du Rwanda (ISAR) had collaborated with local women experts in the testing of improved bean varieties. This research has broken conventional patterns of relations between agricultural research centres and farmers and provided a model for other similar work by national programmes and international agricultural research centres.[5]

The urban impact

23. The only aspect of sustainable development in urban areas examined was income generation and employment. Within these sectors, the main focus was on the employment impact of new technologies, especially information technology. The main conclusion to be derived from this study was that:

- The new information technologies have increased employment opportunities for women, especially in service-sector occupations such as banking and finance. However, the new technologies have also made many existing jobs in manufacturing redundant or obsolete. These changes have affected men and women differently, but overall female labour has been displaced more than male labour. New jobs are more skill-intensive than old ones, and women have been at a disadvantage because of limited training opportunities compared with men.

Box 7

"Teleworking": boon or bain?

One of the expected advantages of information technology was the opportunity that it could provide for "teleworking" from home. Telecommunications technology offers the potential advantage of flexible working hours, and the possibility of combining child care with income generation. It has been found, however, that the disadvantages may exceed the advantages. The social and professional benefits of working with others are foregone and without a dedicated work space, family responsibilities may intrude and the perceived advantages may be ephemeral. Other problems of working at home include isolation of workers who tend to be hired part-time, on a casual contractual basis with few fringe benefits, little job security, and no pension plan. "Tele-cottages" (or technologically equipped spaces), where people can work close to homes, yet be in contact with other workers and have dedicated workspace and equipment would pose fewer disadvantages.

24. Most studies of women's needs and aspirations identify income generation as fundamental. This has led to increased interest in the role of women as entrepreneurs in small and medium-sized enterprises in the formal sector, and in micro-enterprises in the informal sector. Efforts are being made to encourage and facilitate women's participation in such enterprises. Most factors that facilitate this participation are not related to either science or technology but they have more to do with access to credit and other necessary resources. However, technical and managerial training and access to both local and new technologies, including information and technology management and marketing training, are important factors influencing the success of these enterprises.

Box 8

Information Technologies
Powerful tools of transformation in the informal sector

Computer-aided small-scale management and accounting systems have been found to improve business efficiency of women working as street vendors, garment pickers and tailors in the informal sector. The self Employed Women's Association (SEWA) in India is an example of an active non-governmental organization that works with women to make modern technologies for business efficiency accessible to those groups that are normally excluded from the benefits of modern science and technology.

25. Analysis of the impact of technical change on the lives of men and women has shown that it is differential. Sometimes men benefit; other times women benefit. The implication is that a "gender impact analysis" should accompany the development of all new technologies to identify the nature of the differential impact. This would enable supportive policies to be introduced to mitigate any negative impacts on the disadvantaged parties.

Box 9

National campaigns help remove barriers for women's scientific and technical training - cases from China and Botswana -

In 1989, the All China Federation of Women in cooperation with 12 organizations from central government launched a campaign for literacy and technical training for rural women. Along with reading and writing programmes, agricultural and forestry and commerce authorities promoted the establishment of rural enterprises for income generation and production centres. In the course of five years, some 27 million rural women have received technical training and 10 million benefited from the literacy campaign. Some measure of the success of the programme became apparent when many husbands began asking if they could join the training programmes. The technical training for women gave them new skills - some were reported to have said "**science and technology have given us golden wings**".

Other national Governments have launched creative science and technology programs targeted to remove barriers for girls and women in science and technology. One notable example is the *Girls and Women in Science: Science and Technology Roadshow* co-sponsored by the Government of Botswana and the Commonwealth Secretariat as an initiative of the 1989 Conference of the Commonwealth Ministers of Education. The Roadshow, moving from city to city, targets secondary school students, parents, teachers, employers and the public. It is sponsored by local contributions from several sources including hospitals, airlines, universities, private companies and vehicle repair shops as well as local embassies and UNESCO. The Roadshow designed its own slogan and logo for radio and print media releases and builds on enthusiastic local volunteers in each town visited. The Roadshow contains a series of components including role model videos, career guidance clinics, skill-building workshops, essay competitions and a newsletter **Women Make It.**[6]

26. If the objective of science and technology policy is to maximize the benefits from science and technology for all members of society, then ethical considerations must be part of the policy process. This is especially true for gender related issues, which often cut across the rural-urban and the developing-developed divides. Specific examples in the health sector include the application of such technologies as amniocentesis and ultrasound to determine foetal sex for the purpose of selective abortion of the girl child. Another example is the testing of drugs on third world women without their informed consent. These examples underline the need for both the scientific community and governments to develop ethical guidelines for the conduct of research and the application of research results, with particular emphasis on the gender dimension.

II. TRANSFORMATIVE ACTIONS

27. Authors of the background papers commissioned for this report were invited to identify recommendations for change within their sector. As a result, many ideas and recommendations contained in each of the papers will appear in extenso report in the publication entitled *Equity, Knowledge and Empowerment.*[7] The attention of Governments, non-governmental organizations and the scientific community is drawn to this book and its rich store of information and ideas. Drawing on this rich pool of resources, the Gender Working Group sought to identify seven key issues of particular relevance to all countries on which action was both necessary and feasible.

28. Each issue is first stated below, then policy and programme options are outlined for the consideration of Governments and science and technology bodies and agencies.

29. It has not been possible to estimate the costs of implementation. Some will be easy and cost little to implement; others may take a long time and be expensive. Each country would have to determine its own priorities and implement what it can within its means.

Box 10

Issue 1 **Gender equity in science and technology education**

Fewer girls than boys are given the opportunity to obtain formal education. Of the girls who do gain access to schools, a smaller proportion than boys obtain training in science and technology. This limits girls and women's opportunities: to meet their basic needs and improve the quality of their lives and those of their families; gain access to employment; create businesses; and acquire skills for citizenship. It also deprives nations of the contribution of many highly talented citizens. The extra barriers and obstacles confronting girls who seek training in science and technology subjects must be removed.

Transformative actions:

Equity in gaining access:

- Provide the same opportunities for access to formal education for both girls and boys.

Equality of opportunity within schools:

- Ensure literacy and basic instruction in science and technology for both boys and girls.
- Ensure that infrastructure, laboratories, and equipment in schools are equally available to girls and boys.
- Ensure that teaching materials in science and technology are sensitive to gender concerns in terms of language and illustrations. Where possible, these materials should also illustrate the link between the subject matter and everyday lives of girls and boys.
- The teaching of science should be broadened to include elements addressing the economic, social and ethical implications of science and technology.
- Recognize the importance of mentors and role models by women science teachers and provide rewards to those who devote substantial time to this activity.

Opportunity for distance education and re-entry to schools:

- Provide multiple opportunities for re-entering school, especially for young mothers (in some cultures, early marriage and teenage pregnancy are major reasons for girls leaving school).
- Introduce education programmes with flexible locations and times to enable more students, especially girls, to acquire scientific literacy.
- Introduce new approaches to science and technology education such as distance learning, making optimal use of both old (radio) and new (multimedia) technologies.

Box 11

Issue 2 Removing obstacles to women in scientific and technological careers

In many countries, there are few women in scientific and technological careers. In addition to considerations of equity no country can afford to lose up to one-half of its pool of creative and innovative human resources. The obstacles to greater participation of women in scientific and technical careers need to be addressed and overcome.

Transformative actions:

- **Specific measures for all employers:**

  Recent national government task forces and reports[34] have explored options for removing barriers to women in science and technology careers. These include general policies and those that support the professional, personal and family needs of all employees and ensure that the employees are able to balance family responsibilities with professional ones and career development, such as:

  - Alternative work arrangements such as flexible hours, flexible locations, and job-sharing opportunities; and commitment to on-site child care facilities;

  - Maternity and paternity leave policies; hiring and promotion criteria and processes to allow for family responsibilities to be assumed so that maternity, paternity and parental leaves do not jeopardize career progression;

  - Commitment to the hiring, promotion and career development of women in science and technology while adhering to the merit principle;

  - Policies against discrimination and harassment in the workplace.

- **Policy tools for Governments:**

  Tax relief for payment of child-minders; pay equity legislation; legislation against discrimination; directives for collection of gender disaggregated statistics; establishment of focal points for advice on gender in science and technology; an increase in the number of women appointed to policy advisory and decision-making bodies.

- **Initiatives in academia and the school system:**

  Establish networks of female professionals in science and engineering; enhance mentoring, role-model, and career advisory programmes; provide flexible tenure criteria to accommodate family roles and responsibilities; and provide refresher courses, and re-entry scholarships for women returning to careers in science.

Box 12

Issue 3 Making science responsive to the needs of society: the gender dimension

Most professionals working in science and technology are insufficiently aware of the needs of their society and the impact of their work on these needs. Likewise, citizens are insufficiently aware of the positive potential of science and technology to meet these needs. In particular, the gender-specific nature of the needs and the differential impact of science and technology on the lives of men and women are inadequately recognized by either science and technology professionals or citizens.

Transformative actions:

- Improve the decision-making mechanisms within the science system to ensure clear articulation of the gender-specific needs and goals of society by incorporating end-user opinions, both those of women and men. Use decision-making techniques, such as technology assessment and decision framework analysis, that make explicit the gender implications of the decisions taken.

- Encourage political parties and Governments to be more explicit in their policy platforms about how they intend to use "science and technology" to meet the basic needs of both men and women equitably in society.

- Encourage public media to sponsor popular science programming, including reports on the potential of science to serve goals of society and the basic needs of people; promote reporting on the impact of science on people's lives and, in particular the disparate impact of science and technology on men and women.

- Support non-governmental organizations working at the interface of gender in science and technology for development.

Box 13

Issue 4 Making the science and technology decision-making process more "gender aware"

Current structures and processes for decision-making in science and technology for development do not systematically take into account the needs and aspirations of both women and men in a manner that is gender disaggregated. Women's needs and interests have been relatively neglected.

Transformative actions:

- Increase the number of women in science and technology decision-making and policy advisory bodies. Set targets for representation in these bodies, with time horizons and strategies to ensure adherence.

- Establish databases of professional women so as to provide institutions with a pool of names of qualified women to be considered for appointment to policy and advisory bodies.

- Increase the understanding of all decision-makers about the gender implications of their decisions through explicit training programmes.

- Involve end-users, men and women equally, in the determination of research priorities and in the design and implementation of technology and development programmes. This will require explicit attention to the participation of women.

- Subject all development programmes with a high science and technology component to "gender impact analysis" before initiation. Gender analysis should be included in the design and the subsequent monitoring and evaluation. Technology assessment techniques and the decision framework should incorporate a gender dimension.

- Governments should establish a focal point of expertise in gender, science and technology to be available to advise government departments, facilitate training sessions, and monitor and report on the implementation of government strategies regarding gender, science and technology.

Box 14

Issue 5 Links with "local knowledge systems"

Modern science and technology has inadequately addressed the potential of local knowledge systems, especially women's knowledge, in the design and implementation of development programmes. There is a need to develop new methods of interaction between the two systems for their mutual benefit. Local knowledge is frequently not recorded and is in danger of being lost.

Transformative actions:

- Ensure the preservation of local knowledge systems with attention to their gender-specific nature.
- Development agencies should give full consideration to the contributions of local knowledge systems, giving particular recognition to the gender-specific nature of these systems.
- Make greater efforts to find creative ways to promote mutually beneficial exchanges between modern and traditional knowledge systems and technologies for the benefit of both women and men in rural areas.
- Bodies engaged in the study and promotion of intellectual property rights should address the capability of the present system to protect local knowledge owned by communities, paying special attention to its gender-specific nature. When external agencies exploit this knowledge for commercial gain, mechanisms should be found for compensating the men and/or women in communities where the knowledge originated.

Box 15

Issue 6 Addressing ethical issues in science and technology: the gender dimension

Ethical issues associated with both the conduct of scientific research and the application of the results of research frequently have a gender dimension which has not been sufficiently recognized or addressed.

Transformative actions:

- National and international scientific organizations - both governmental and non-governmental, should develop international conventions, declarations or ethical codes of conduct to provide clear boundaries of acceptable practice both in research and in applications pertaining to their fields of responsibility. These should be widely promulgated.

- National Governments should consider whether legislation is needed to enforce adherence to these codes of conduct. The use of technical procedures to identify foetal sex when the purpose is to abort the girl child is a case where some national Governments have taken action to legislate the boundaries of unacceptable practice. Other examples include testing of drugs on underprivileged groups, particularly women; the exploitation of local knowledge for commercial gain by outside organizations without appropriate acknowledgement and compensation.

- In determining the ethical issues on which guidelines and codes of conduct are to be developed, there should be wide consultation and involvement of stake-holders and end-users.

Box 16

Issue 7 Improving the collection of gender disaggregated data for policy makers

There is a paucity of data available at the national and international levels on participation rates of men and women in scientific and technological education and careers. There still is no systematic approach or coordinated method for ensuring the collection of gender-disaggregated data on science and technology. Of equal importance to policy-makers is the unavailability of data on the differential impact of technical change on men and women's lives.

Transformative actions:

- An international meeting of statisticians, along with science, technology, and gender specialists from national and international bodies should be convened by the United Nations (possibly UNESCO) to identify the critical statistics necessary for policy purposes; to designate responsibility centres; and to establish mechanisms for coordination and collaboration. Methods and common approaches should be decided on to permit cross-cultural comparisons over time and to ensure the best use of resources.

- National Governments and the United Nations system should revise statistics data-collection methods to ensure gender-disaggregated statistics are systematically and regularly collected both on participation rates and on differential impact; these bodies should coordinate efforts to ensure the collection of complementary sets of data, using common methods.

- Data collected by national Governments should be made available to both local and international bodies to ensure their maximum use in policy and programme formulation and to ensure their aggregation at the regional and international levels.

- Scientific bodies, universities, and academies should also collect relevant gender-disaggregated data.

III. PERFORMANCE OF THE UNITED NATIONS SYSTEM

30. The Gender Working Group was asked to review the performance of United Nations agencies in the domain of gender, science and technology. This task was to include an assessment of inter-agency coordination.

31. At the request of the Gender Working Group, United Nations Development Fund for Women undertook a review of international organizations (in New York, Washington, Geneva, Rome, Vienna, Paris and Bangkok), visited in February and March 1994.* Detailed information was obtained on their policies, structure, staffing programming, and evaluation activities as well as on interagency coordination and relations with non-governmental organizations.

32. A written and oral report summarizing the United Nations Development Fund for Women exercise was presented to the Gender Working Group in April

1994. Following discussion of the paper, the Gender Working Group concluded that:

(a) Most organizations have a commitment to gender concerns often enshrined in policy resolutions, and may have departments, programmes and/or focal points to deal with gender questions; many also have a strong commitment to science and technology. However, only four agencies had clearly identifiable gender, science and technology focal points and in all cases (except the United Nations Development Fund for Women and the United Nations International Research and Training Institute for the Advancement of Women), there was no organization-wide recognition and promotion of gender and science and technology issues.

(b) In relation to most programmes and projects, the concern is to help women gain equal access to improved technologies. There is less emphasis on involving women in the process of technology development and little attention to promoting women's increased involvement in science and technology decision-making or systematic incorporation of women's perspectives into the formal science and technology system.

(c) Intra-agency mechanisms for appraising, monitoring and evaluating gender, science and technology projects and programmes is very weak for a variety of structural, staffing and financial reasons. As a result, gender perspectives have not been integrated effectively into science and technology activities within the United Nations system.

(d) Although there is some evidence of interagency collaboration on these issues, it takes place on an *ad hoc* rather a coordinated or strategic basis; while there is increased recognition of the importance of learning from the experience of non-governmental organizations, few agencies have developed mechanisms for supporting non-governmental organizations and working effectively with them.

33. The members of the Gender Working Group also requested a follow-up review by an independent consultant. Accordingly, and within budgetary limitations, selected agencies' were visited in May 1994 and a draft report was presented to the Gender Working Group in July 1994. A matrix was prepared comparing policies across agencies.

34. Following a discussion of the consultant's report, the members of the Gender Working Group concluded that:

(a) Most United Nations agencies perceive the theme of gender, science and technology as being marginal to their central main mandate. Promoting an awareness of the relations between gender, science and technology should include the provision of practical examples of how current programmes can contain a gender bias and how obstacles can be overcome by incorporating "gender analysis" into the design of science and technology policies and programmes. The agencies and governing councils representing the member States, in recognition of the importance of gender issues, should require monitoring and regular reporting of agency actions addressing the incorporation of gender analysis and assessment into policies, programmes, and projects related science and technology.

(b) While there is some evidence to suggest that the positioning of high-level women professionals in key technical posts can assist in "rendering" science and technology policies and programming more gender-balanced and while improvements have been made in some agencies (e.g., World Health Organization, United Nations High Commissioner for Refugees) in recent years, there are still very few women in senior management or technical advisory positions. Although the gender balance should continue to improve in response to resolutions of the governing councils, the organizations should be required to report regularly on progress in the recruitment and promotion of women professionals;

(c) There is little collaboration between gender focal points and science and technology focal points within agencies with respect to the design, monitoring, and evaluation of policies, programmes and projects. Moreover, there is a lack of specific guidelines to assist scientific and technical staff to undertake this task. Recent attempts by, for example, the United Nations Industrial Development Organization and the Women, Science and Technology programme of United Nations Educational, Scientific and Cultural Organization to introduce agency-wide programmes aimed at integration among units should help promote awareness.

(d) Although a few examples exist of studies on the "impact of technology projects" on women, there is a general lack of gender-disaggregated "impact assessment" data available to improve programming. The problem of undertaking such assessments is a generic one, but there are few guidelines on how to build gender, science and technology questions into routine monitoring and evaluation.

(e) United Nations agencies tend to work in isolation owing in part to their perceived separate mandates and to difficulties in communication (lack of travel budgets, absence of e-mail networking, etc.). Although instituting formal mechanisms for coordination would not necessarily promote better exchange of information, support should be given to methods to promote and sustain exchange between gender focal points and science and technology focal points on an agency-wide basis.

(f) Although there is a general trend in the United Nations system to work with non-governmental organizations, only selected organizations, such as World Health Organization, International Labour Organisation, United Nations High Commissioner for Refugees, United Nations Development Fund for Women, and United Nations Children's Fund have established formal relations with non-governmental organizations at both the policy and field programme/project level. This trend reflects the heightened awareness in recent years of the capabilities of non-governmental organizations to contribute to development policy, including their ability to deliver cost-effective programmes and gain detailed knowledge of local communities. The experience of United Nations Development Fund for Women, International Fund for Agricultural Development, United Nations Industrial Development Organization, International Labour Organisation, and others testifies to the effectiveness of system-wide collaboration with non-governmental organizations. Agencies that have not yet fully recognized the contribution of non-governmental organizations to their activities should be encouraged to do so. A 1994 survey of United Nations Development Fund for Women identified some 650 non-governmental organizations active in the field of gender, science and technology. A consortium of these non-governmental organizations - known as the Once in Future Action Network - is actively planning a contribution to the 1995 United Nations fourth World Conference on Women in Development, so as to ensure a high profile for issues of gender in science and technology, in Beijing and beyond.

RECOMMENDATIONS

35. In light of these conclusions, the Gender Working Group make the following recommendations.

Recommendation 1:

The United Nations should be required to review its current organizational policy to ensure that gender, science and technology is formally incorporated into policy. For successful implementation of such policy, gender, science and technology specialists within each organization and agency should be required to prepare case studies and training materials. Monitoring and evaluation and statistical divisions within each organization should establish a process for the systematic collection of gender-disaggregated data. They should

furthermore collaborate to ensure common methods. Progress should be assessed on an on-going basis. A relevant specialized agency should be requested to assist the United Nations system in this task, with the United Nations secretariat for overseeing initiation and monitoring of progress. Policies should be reviewed and action taken on implementation by September 1996.

Recommendation 2:

United Nations agencies should actively respond to policies calling for recruitment of professional women by establishing clear targets and time horizons for recruitment of women into high-level professional posts with strategic importance for science and technology. There should be explicit pro-active recruitment, retention, and re-entry programmes with supporting policies for high-level professional women in science and technology. The organizations and agencies should be required to report regularly to their governing bodies on progress achieved and specific constraints encountered. In this regard, they should review early successful experiences, such as that of the Consultative Group for International Agricultural Research and the World Health Organization. Progress should be reported through the United Nations secretariat by September 1996.

Recommendation 3:

United Nations agencies should use accessible and practical guidelines for incorporating gender analysis and assessment into the design of science and technology policies, programmes and projects. Although each agency has a distinct mandate and programming approach and guidelines will have to be specific to individual agencies, a set of general guidelines that could be adapted to specific circumstances could be useful. The guidelines developed by the United Nation Development Fund for Women could serve as a basis. Specific guidelines should be developed and in place by September 1996 with briefing of relevant staff on implementation of policies. Progress should be reported annually through the United Nations secretariat.

Recommendation 4:

The United Nations should establish procedures to research, document, monitor and evaluate the gender impact of their science and technology programmes, including regular reporting of the results and lessons learned to the respective governing councils. The experience in this area of such organizations and agencies as the International Labour Organisation, the United Nations Industrial Development Organization, and the United Nations Development Fund for Women could be built upon to develop general guidelines for adoption by other agencies. Gender, science and technology specialists in each organization and agency should work together with monitoring and evaluation units to implement this process. Specific guidelines should be developed and in place by September 1996 with evidence of incorporation in at least one project document. Progress should be regularly reported through the United Nations secretariat.

Recommendation 5:

The United Nations should give full support to strengthening and sustaining informal methods of interagency networking on gender, science and technology issues. The Commission on Science and Technology for Development should interact with this network to ensure a gender perspective and mutual support in achieving goals. The United Nations should investigate alternative methods of increasing intra- and interagency communication in this area by, for example, establishing an electronic network link on gender, science and technology. This could be linked with existing non-governmental organization networks. United Nations Development Fund for Women and the United Nation Industrial

Development Organization should be called upon to facilitate this process in conjunction with the United Nations secretariat.

Recommendation 6:

The United Nations system, and particularly those agencies reviewed by the Commission Science and Technology for Development Working Group as having functions at the interface of science and technology, should incorporate "gender and science and technology" analysis into all regular programmes, and through redistribution of agency funding priorities, and provide increased regular budgetary allocations to gender units. Technically based agencies should support adequate staffing of gender experts and require training of all staff in gender analysis to ensure full incorporation of gender into their regular work programmes. Progress should be monitored through the United Nations secretariat by September 1996.

Recommendation 7:

The United Nations should recognize the value of collaboration with non-governmental organizations and expand its formal partnership with and support for these organizations both in terms of implementing field projects and obtaining policy advice and assistance with the design, implementation and evaluation of gender-sensitive technical cooperation programmes. Partnerships with the over 650 non-governmental organizations active in gender, science and technology should be forged. Models such as those being developed by the United Nations High Commissioner for Refugees could be explored and approaches suitable for each agency identified. Ongoing United Nations support for the non-governmental organization science and technology consortium, Once and Future Action Network, would assist in this process. Relevant United Nations staff focal points for gender and science and technology should be supported to participate in the on-going activities of the non-governmental organization consortium. Agencies should explore options and begin to implement plans to enhance cooperation and support to non-governmental organizations by September 1996. Progress should be reported through the United Nations secretariat. Up to 10 of the most relevant agencies should be active participants in the non-governmental consortium by September 1996.

Recommendation 8:

The Gender Working Group recommends the establishment of an Advisory Board on Gender to the Commission on Science and Technology for Development for four years to ensure that gender issues are adequately addressed in all future deliberations of the Commission on Science and Technology for Development. The advisory board should consist of seven international gender experts, appointed by the Secretary General. Among its initial responsibilities will be the task of monitoring implementation of the above recommendations.

The United Nations secretariat should support the advisory board in its activities.

IV. CONCLUSION: A DECLARATION OF INTENT

36. The report and the background papers on which it is based contain a rich collection of ideas and policy measures. They could be the basis for reform of both of the current science and technology system and of the ways in which the output of that system is used to contribute to sustainable human development for the benefit of both men and women. The specific measures adopted by each Government will necessarily depend on the national context. The changes proposed, therefore, are provided as a list of possible actions that each country may adopt according to its own specific situation.

37. Two recommendations, however, apply to all countries and a third is directed at donor Governments. The **first** is that all Governments should agree to adopt a declaration of intent on gender, science and technology for sustainable human development. This declaration would consist of important goals toward which each country should move.

38. As it is not for the Gender Working Group to suggest specific ways in which each country should implement its declaration of intent, the **second recommendation**, therefore, is that each country should establish an *ad hoc* committee to make recommendations to its own Government on how the goals in the declaration might be implemented under the specific conditions of that country. We recognize that, to implement the recommendations of its own ad hoc committee, each Government would need to pass appropriate legislation and establish regulatory policy frameworks.

39. The **third recommendation** is directed to donor countries and agencies. Donor agencies may help the national *ad hoc* committee on gender and science and technology to obtain access to relevant information, and should target financial support to projects that enable recipient countries to implement the recommendations of their own relevant *ad hoc* committee.

Box 17

A "declaration of intent" on gender, science and technology for sustainable human development

All Governments agree to work actively towards the following goals:

(1) To ensure basic education for all, with particular emphasis on scientific and technological literacy, so that all women and men can effectively use science and technology to meet basic needs.

(2) To ensure that men and women have equal opportunity to acquire advanced training in science and technology and to pursue careers as technologists, scientists and engineers.

(3) To achieve gender equity within science and technology institutions, including policy and decision-making bodies.

(4) To ensure that the needs and aspirations of women and men are equally taken into account in the setting of research priorities and in the design, transfer and application of new technologies.

(5) To ensure all men and women have equal access to the information and knowledge, particularly scientific and technological knowledge, that they need to improve their standard of living and quality of life.

(6) To recognize local knowledge systems, where they exist, and their gender-specific nature as a source of knowledge complementary to modern science and technology and also valuable for sustainable human development.

Box 18

MECHANISMS FOR ACHIEVING THE GOALS OF THE DECLARATION OF INTENT

The manner in which Governments adopt strategies to achieve these goals will depend on the national context. It is, therefore, recommended that:

(1) Each country establish an ad hoc committee to review the national situation regarding gender and science and technology and to devise action plans and time horizons so as to achieve the goals stated in the declaration of intent.

(2) These ad hoc committees should be constituted with equitable participation of women and men and with involvement of end-users and stake-holders.

(3) Country reports on progress in achieving the goals of the declaration of intent should be published.

Box 19

RECOMMENDATION TO DONORS

Donor agencies should target their financial support at projects that enable recipient countries to implement the recommendations of their own ad hoc committee on gender and science and technology.

Notes

1. United Nations Development Programme, *Administrator Speech* UNDP, New York, 1994.

2. United Nations Development Programme, *Human development report*, UNDP, New York, 1993.

3. APPROTECH-Asia. 1992. *Mainstreaming women in science and technology*, WISE-Thailand, Bangkok, Thailand.

3a. Baringa, Marcia. 1994. Overview: surprises across the cultural divide. *Science*, 263. Ellis, Patricia. 1990. *Measures increasing the participation of girls and women in technical and vocation education and training: a Caribbean study*. Commonwealth Secretariat, London, UK. Logue, H.A.; Talapessy, L.M., ed. 1993. *Women in science: international workshop proceedings*. European Commission, Brussels, Belgium. National Advisory Board on Science and Technology. 1993. *Winning with women in trades, technology, science and engineering*. Government of Canada, Ottawa, Canada. Office of Science and Technology. 1993. *The rising tide: a report on women in science, engineering and technology*. Office of Science and Technology, London, United Kingdom. sub-Sahara Africa Programme. 1993. *Science in Africa: women leading from strength*. AAAS, Washington, DC, USA. UNESCO. 1994. *Statistical yearbook 1990-1991*. UNESCO, Paris, France. WISET (Women in Science, Engineering and Technology Advisory Group). 1994. *Draft report*. WISET, Australia.

4. Office of International Affairs. 1994. *Barriers faced by developing country women entering professions in science and technology*. Board on Science and Technology for International Development, National Research Council, Washington, DC, USA.

5. CGIAR (Consultative Group on International Agricultural Research). 1994. *Partners in selection: bean breeders and women bean experts in Rwanda*. CGIAR, Washington, DC, USA.

6. Ministry of Education, Government of Botswana. January 1991. *Girls and Women in Science: Science and Technology Roadshow*.

7. *Equity, Knowledge and Empowerment: The Gender Dimension of Science and Technology for Sustainable Human Development*. International Development Research Centre, Ottawa, 1995.

8. The agencies are: International Trade Centre UNCTAD/GATT, United Nations Children's Fund, United Nations Conference on Trade and Development, United Nations Development Fund for Women, United Nations Development Programme, United Nations Economic and Social Commission for Asia and the Pacific, United Nations Environment Programme, United Nations Fund for Population Activities, United Nations High Commissioner for Refugees, United Nations International Research and Training Institute for the Advancement of Women, United Nations Research Institute for Social Development, United Nations University, World Food Programme, Consultative Group on International Agricultural Research (World Bank), Food and Agriculture Organization of the United Nations, International Atomic Energy Agency, United Nations Education, Scientific and Cultural Organization, United Nations Industrial Development Organization, World Bank, World Health Organization, World Intellectual Property Organization, Inter-American Development Bank, International Coffee Organization.

9. They were: United Nations Conference on Trade and Development, United Nations Development Fund for Women, United Nations High Commissioner for Refugees, United Nations Research Institute for Social Development, International Atomic Energy Agency, International Labour Organization, United Nations Educational, Scientific and Cultural Organization, United Nations High Commissioner for Refugees, United Nations Industrial Development Organization.

10. International Development Research Centre, World Women's Veterinary Association. 1994. *Gender in Science and Technology for Sustainable and Equitable Development.*

Annex

The Process
An example of the new working style of Commission on Science and Technology for Development

The **Gender Working Group (GWG)** undertook a highly participatory and inclusive process throughout the course of its two years of work. The Gender Working Group consisted of eight delegates from the countries of Burundi, of China, Costa Rica, Netherlands, Romania, Saudi Arabia, United Republic of Tanzania and United Kingdom. As all eight members were men, the first action was to form an advisory board of women international policy experts in gender, science and technology from: Brazil, China, Costa Rica, Egypt, Netherlands, Peru, Romania, United States of America and Uganda, to join as equal members in reaching a consensus report. A director of studies was appointed to design and coordinate the process. An active fund-raising campaign secured funds from a range of donors and individuals in support of the work on gender of the Commission on Science and Technology for Development.

Close collaboration was forged from the outset with the Commission on the Status for Women to establish links with policy preparations for the 1995 Fourth World Conference on Women in Development in Beijing. The first meeting of the Gender Working Group was held in conjunction with the Expert Group Meeting on Gender in Science and Technology organized by the United Nation Development Fund for Women for the Secretary General of the Beijing Conference which brought together over 60 international experts on gender, science and technology. Nine themes were selected for analysis and papers commissioned from experts to provide the substance for subsequent deliberations. The full text of the commissioned papers will be published by the International Development Research Centre as a book entitled Equity, Knowledge and Empowerment. Interim reports were tabled by the Chairperson at the March 1994 intergovernmental Beijing preparatory meeting in New York, and by Gender Working Group members at three further regional Beijing preparatory meetings.

A concerted effort was made to tap into the rich base of knowledge and expertise of the large and active community of women's non-governmental organizations active in the domain of gender, science and technology. A guidebook Gender in Science and Technology for Sustainable and Equitable Development* was compiled by the World's Women Veterinary Association as a background document and tabled by the Secretary General of the Beijing Conference for the Commission on the Status of Women. A team of research assistants prepared profiles of previous recommendations in each sector.

An extensive review of the United Nations system was commissioned and a report of agency performance in gender, science and technology prepared. A matrix summarizing performance indicators including corporate policy, human resource policy, programme resource allocation, and impact analysis procedures was prepared to permit cross-agency comparison. A set of recommendations was agreed upon for transmission to the United Nations Economic and Social Council.

The draft report was circulated to over 350 science advisory boards, academies, royal societies, research centres, United Nations organizations and agencies and non-governmental organizations for comment. The report represents a consensus of the international team of the Gender Working Group but it also reflects an example of a highly participatory process.

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* International Development Research Centre, World Women's Veterinary Association, 1994, Gender in Science and Technology for Sustainable and Equitable Development.

List of key participants

A. Members of the Gender Working Group

Commissioners

Burundi	Stanislas Ruzenza
China	Wang Shaoqi
	Xuan Zengpei[2]
	Fan Lijun[2]
Costa Rica	Orlando M. Morales
	Juanita Carabuigaz[2]
	Eugenia Flores Vindas[1]
Netherlands	George Waardenburg
Romania	Georges Matache
Saudi Arabia	Mansour Almalik
United Republic of Tanzania	Titus Mteleka
United Kingdom (Chairman)	Geoffrey Oldham

Advisors

Brazil	Sonia Corrêa
China	Dong Guilan
Egypt	Farkhonda Hassan
Netherlands	Joske Bunders-Aelen
Peru	Maria Fernandez
Romania	Monica Aurite
	Marina Ranga[1]
Uganda	Winnie Byanyima
USA	Shirley Malcolm

[1] New member [2] Substitute

B. Consultants/Author (Country of Origin)

Helen Appleton (United Kingdom)
Marilyn Carr (United Kingdom)
Ruvimbo Chimedza (Zimbabwe)
Maria Fernandez (Peru)
Priyanthi Fernando (Sri Lanka)
Pamela Fraser-Abder (Trinidad and Tobago)
Catherine Hill (Canada)
Merle Jacob (Trinidad and Tobago)
Arminée Kazanjian (Egypt)
Bonnie Kettel (Canada)
Elizabeth Cecelski (Germany)
Gillian Marcelle (Trinidad and Tobago)
Jayshree Mehta (India)
Swasti Mitter (India)
Shimwaayi Muntemba (Kenya)
Consuelo Quiroz (Venezuela)
Eva Rathgeber (Canada)
Martha Stone (Canada)
Judi Wakhungu (Kenya)
Roger Young (Canada)
Soon-Young Yoon (Democratic People's Republic of Korea)

C. The secretariat of the Gender Working Group

Director of Studies	Elizabeth McGregor
UNCTAD secretariat	Zeljka Kozul-Wright
Administrative Assistant	Johanne Hamelin-O'Connor
Research Assistants	Fabiola Bazo
	Perpetua Katepa-Kalala
	Angela Pasceri
	Ioanna Sahas
	Jeea Saraswati

Acknowledgements:

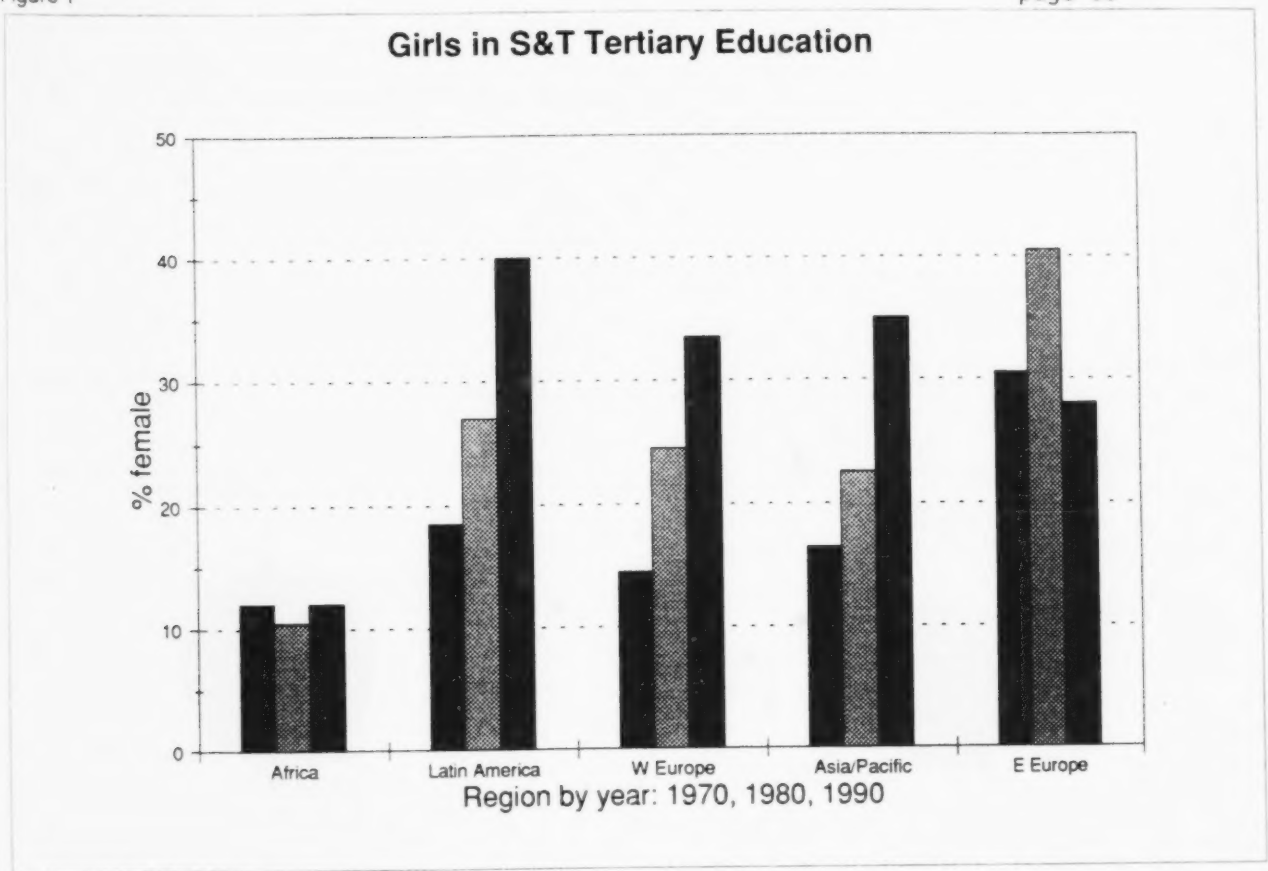
The Commission gratefully acknowledges the financial contributions of: The Ministry of Foreign Affairs (Netherlands); International Development Research Centre (Canada); Agency for International Development (USA); Swedish Agency for Research Cooperation (Sweden); United Nations Fund for Women in Development (UNIFEM); Carnegie Corporation of New York (USA); the World Women's Veterinary Association; and Mr. William Hewlett.

In addition, the following organizations made substantial non-financial contributions in time and their substantive assistance is deeply appreciated: Gender Science and Development Programme (IFIAS); BOSTID (National Academy of Sciences), and The Third World Organization of Women in Science. Thanks are due also to the Governments of the Netherlands and Costa Rica, as well as the Inter-American Institute for Cooperation on Agriculture, for hosting the meetings.

Glossary of acronyms

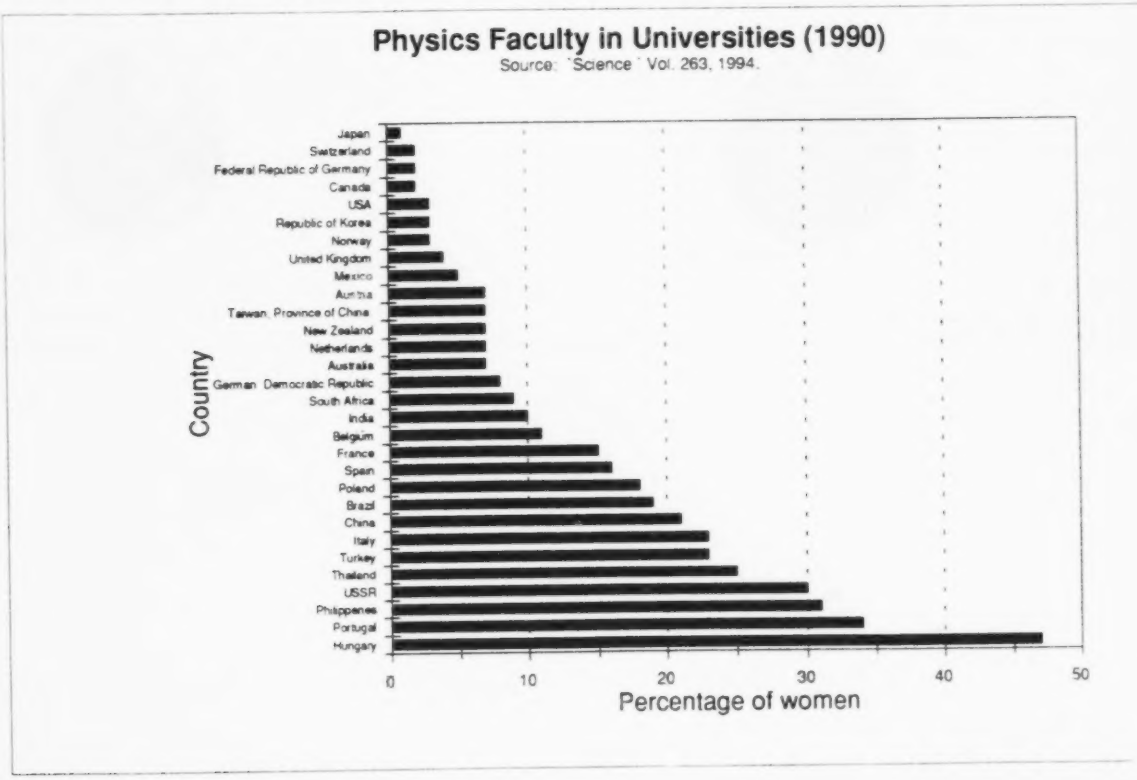
APPROTECH	Appropriate Technology - Asia
CGIAR	Consultative Group for International Agricultural Research
CSW	Commission on the Status of Women
ECOSOC	United Nations Economic and Social Council
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
FAO	Food and Agriculture Organization of the United Nations
GAD	Gender And Development
GASAT	Gender and Science and Technology
GSD	Gender and Sustainable Development
IAEA	International Atomic Energy Agency
IDB	Inter-American Development Bank
IDRC	International Development Research Centre, Ottawa, Canada
IFAD	International Fund for Agricultural Development
IFIAS	International Federation of Institutes for Advanced Study
IICA	Inter-American Institute for Cooperation on Agriculture
ILO	International Labour Organisation
INSTRAW	International Research and Training Institute for the Advancement of Women
IT	Information Technology
ITC	United Nations International Trade Centre (UNCTAD/GATT)
ITDG	Intermediate Technology Development Group
NGO	Non-governmental Organization
OECD	Organization for Economic Cooperation and Development
PAWETS	Pan African Women Engineers, Technicians and Scientists Network
SEWA	Self Employed Women's Association
SWAGSD	Senior Women's Advisory Group on Sustainable Development
TAMWA	Tanzania Media Women's Association
TWOWS	Third World Organization of Women in Science
UNCED	United Nations Conference on Environment and Development
UNCSTD	United Nations Commission on Science and Technology for Development
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFPA	United Nations Population Fund
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
UNIFEM	United Nations Development Fund for Women
UNRISD	United Nations Research Institute for Social Development
UNU	United Nations University
UNV	United Nations Volunteers
WFP	United Nations World Food Programme
WHO	World Health Organization
WID	Women In Development
WIPO	World Intellectual Property Organization
WISE	Women in Science and Engineering
WISENET	Women in Science Enquiry Network
WWVA	World Women's Veterinary Association

Figure 1



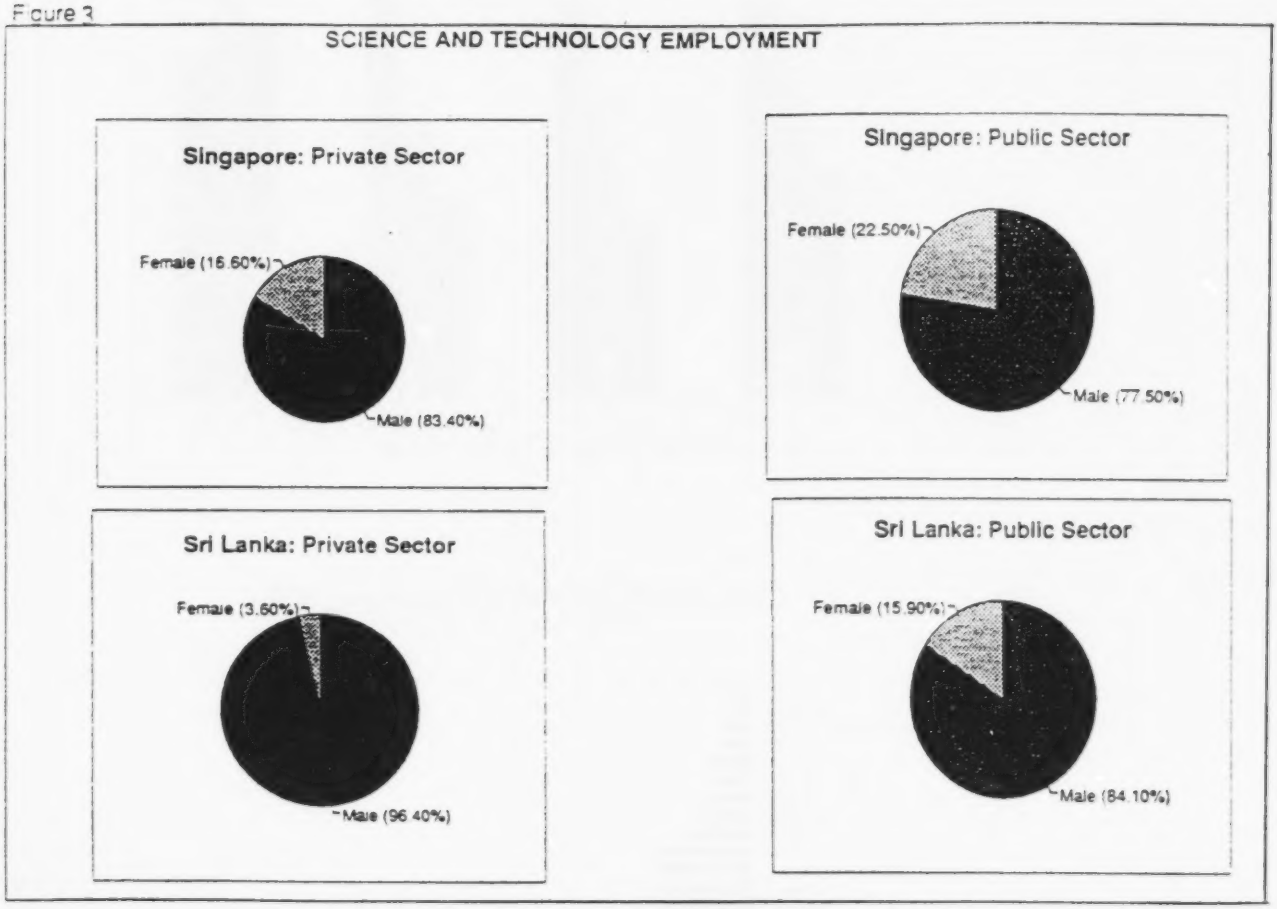
Source: UNCTAD, 1994

Figure 2



Source: Jim Megaw (1990) in Barinaga, Science Vol. 263, 1994

Figure 3


SCIENCE AND TECHNOLOGY EMPLOYMENT
Singapore: Private Sector
Female (16.60%)
Male (83.40%)
Singapore: Public Sector
Female (22.50%)
Male (77.50%)
Sri Lanka: Private Sector
Female (3.60%)
Male (96.40%)
Sri Lanka: Public Sector
Female (15.90%)
Male (84.10%)